

What is claimed is:

1. A projection lens system, comprising:
a plurality of lenses; and
at least one diffractive optical element formed on at
least one among the surfaces of the lenses.

2. The projection lens system according to claim 1,
wherein one surface of the diffractive optical element
includes a groove having a rotation symmetry on a
spherical surface.

3. The projection lens system according to claim 1,
wherein one surface of the diffractive optical element
includes a groove having a rotation symmetry on a plane
surface.

4. The projection lens system according to claim 1,
wherein the diffractive optical element includes a
positive refractive power.

5. The projection lens system according to claim 1,
wherein the diffractive optical element includes a
negative refractive power.

6. The projection lens system according to claim 1,
wherein one surface of the diffractive optical element
includes a pitch of grooves having a rotation symmetry on
a spherical surface.

7. The projection lens system according to claim 1,

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wherein one surface of the diffractive optical element includes a pitch of grooves having a rotation symmetry on a plane surface.

- 5 8. A projection lens system, comprising:
a plurality of refractive lenses; and
at least one diffractive optical element formed on at least one among the faces of the refractive lenses to correct chromatic aberrations at on axis and off axis.

- 10 9. The projection lens system according to claim 8,
wherein one surface of the diffractive optical element includes a groove having a rotation symmetry on a spherical surface.

- 15 10. The projection lens system according to claim 8,
wherein one surface of the diffractive optical element includes a groove having a rotation symmetry on a plane surface.

- 20 11. The projection lens system according to claim 8,
wherein the diffractive optical element has a positive refractive power.

- 25 12. The projection lens system according to claim 8,
wherein the diffractive optical element has a negative refractive power.

- 30 13. The projection lens system according to claim 8,
wherein one surface of the diffractive optical element includes a pitch of grooves having a rotation symmetry on

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a spherical surface.

14. The projection lens system according to claim 8,
wherein one surface of the diffractive optical element
s includes a pitch of grooves having a rotation symmetry on
a plane surface.

15. A projection lens system, comprising:
a first lens for correcting an aberration generated
10 by a variation of height from a light axis, the first lens
having at least one surface formed with diffractive
optical element thereon;

a second lens for refracting lights passed through
the first lens; and

15 a third lens for correcting a field curvature and an
astigmatism of the lights passed through the second lens.

16. The projection lens system according to claim 15,
wherein the first lens has a side of aspheric surface and
another side of diffractive optical surface.

17. The projection lens system according to claim 15,
wherein one surface of the diffractive optical element
includes a groove having a rotation symmetry on a
25 spherical surface.

18. The projection lens system according to claim 15,
wherein one surface of the diffractive optical element
includes a groove having a rotation symmetry on a plane
30 surface.

19. A projection lens system, comprising:

a first lens having a positive refractive power at the center thereof and a negative refractive power at the peripheral thereof;

5 a second lens having a relatively large positive refractive power;

a third lens having a positive refractive power;

a fourth lens having a negative refractive power; and

10 a diffractive optical element formed on at least one surface of said lenses.

20. The projection lens system according to claim 19, wherein said first, third and fourth lenses (are) designed to have a aspheric surface.

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21. The projection lens system according to claim 19, wherein one surface of said first lens is designed to have a aspheric surface and the other surface of said first lens is designed into a surface of the diffractive optical
20 element.

22. The projection lens system according to claim 19, wherein one surface of said third lens is designed to have an aspheric surface and the other surface of said first
25 lens is designed into a surface of the diffractive optical element.

23. The projection lens system according to claim 19, wherein a plurality of recesses with a shape of concentric
30 circles are provided at the diffractive optical element in such a manner to have a rotational symmetry.

24. The projection lens system according to claim 23,
wherein pitches of said recesses are decreased in such a
manner that a phase amount is reduced as it goes from the
center of the diffractive optical element into the
peripheral thereof.

25. The projection lens system according to claim 19,
wherein at least one of said lenses is made from a plastic.

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26. A projection lens system, comprising:
a first lens having a weak refractive power;
a second lens having a weak refractive power;
a third lens having a strong positive refractive
power;
a fourth lens for correcting an aberration generated
by the third lens;
a fifth lens having a negative refractive power; and
at least one diffractive optical element formed on at
least one among the surfaces of the lenses.

27. The projection lens system according to claim 26,
wherein the first lens has an upper surface of convex
shape, both side of the second lens are in convex surface,
and the fourth lens includes at one surface having a
diffractive optical element.

28. The projection lens system according to claim 26,
wherein one surface of said first lens is designed to have
an aspheric surface and the other surface of said first
lens is designed into a surface of the diffractive optical

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element.

29. The projection lens system according to claim 26,
wherein one surface of said second lens is designed to
5 have an aspheric surface and the other surface of said
second lens is designed into a surface of the diffractive
optical element.

30. The projection lens system according to claim 26,
10 wherein one surface of said fourth lens is designed to
have an aspheric surface and the other surface of said
fourth lens is designed into a surface of the diffractive
optical element.

31. The projection lens system according to claim 26,
15 wherein the fourth lens has a weak refractive power.

32. The projection lens system according to claim 26,
wherein the diffractive optical element has a positive
20 refractive power.

33. The projection lens system according to claim 26,
wherein the diffractive optical element has a negative
refractive power.

34. The projection lens system according to claim 26,
25 wherein one surface of the diffractive optical element
includes a plurality of grooves having a rotation symmetry
and a shape of concentric circles.

35. The projection lens system according to claim 26,
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36. The projection lens system according to claim 26, wherein the second lens has a negative refractive power.

37. The projection lens system according to claim 26, wherein at least one among the lenses is made from a plastic material.

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